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United States Government

Department of Energy

memorandum

Carlsbad Field Office
Carlsbad, New Mexico 88221

DATE: August 8, 2003

REPLY TO ATTN OF: CBFO:QA:DSM:GS:03-2521:UFC 2300.00

SUBJECT: Audit Report A-03-22, Rocky Flats Environmental Technology Site (RFETS) Characterization of Waste Certification Audit

TO: John Schneider, Assistant Manager for Projects

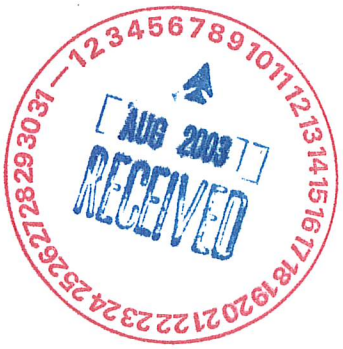
The Carlsbad Field Office (CBFO) conducted a certification audit of the Rocky Flats Environmental Technology Site (RFETS) waste characterization activities. The audit was conducted on July 22-24, 2003. The audit team concluded that the RFETS technical and quality assurance programs for these activities were adequate in accordance with the WIPP Hazardous Waste Facility Permit, the CBFO Contact-Handled Transuranic Waste Acceptance Criteria for the WIPP, and the CBFO Quality Assurance Program Document The audit team also concluded that overall the RFETS procedures were being satisfactorily implemented and the evaluated processes were effective.

No CBFO Corrective Action Reports (CARs) were issued as a result of the audit.

If you have any questions or comments, please contact me at (505) 234-7491.

D. S. Miehls

Dennis S. Miehls
Quality Assurance Specialist



Attachment

cc w/attachments:

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K. Watson, CBFO	*ED
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G. O'Leary, RFETS	*ED
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CBFO QA File	
CBFO M&RC	

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U.S. DEPARTMENT OF ENERGY
CARLSBAD FIELD OFFICE

AUDIT REPORT

OF THE

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
GOLDEN, COLORADO

AUDIT NUMBER A-03-22

July 22-24, 2003

AUDIT REPORT OF WASTE CHARACTERIZATION ACTIVITIES

Polymerized Organic Waste Sampling
Small Container Waste Sampling
Tomographic Gamma Scanner
FRAM

Prepared By: _____ **Date:** 7/7/03
Charles L. Riggs, CTAC
Audit Team Leader

Approved By: _____ **Date:** 8/8/03
Ava L. [illegible], CBFO
Quality Assurance Manager

1.0 EXECUTIVE SUMMARY

Carlsbad Field Office (CBFO) Audit A-03-22 was conducted to evaluate the adequacy, implementation, and effectiveness of the Rocky Flats Environmental Technology Site (RFETS) transuranic (TRU) waste characterization activities relative to the requirements contained in the Waste Isolation Pilot Plant (WIPP) Hazardous Waste Facility Permit (HWFP), the Contact-Handled Transuranic Waste Acceptance Criteria (CH-WAC) for the WIPP, and the Quality Assurance Program Document (QAPD).

The audit scope included Summary Category Group S3000 solid wastes and S5000 debris wastes. The audit evaluated two new solid sampling processes: polymerized organic waste sampling and small container waste sampling. In addition, the Building 664 Tomographic Gamma Scanner (TGS) (55-gallon containers, glass matrix) and Building 440 Fixed Energy Response Function Analysis With Multiple Efficiencies gamma spectroscopy (FRAM) (85-gallon overpack containers, sludge) were evaluated.

The audit was conducted at RFETS July 22-24, 2003. The audit team concluded that the overall adequacy of the RFETS technical and quality assurance (QA) programs, as applicable to audited activities, was satisfactory in meeting requirements. The audit team also concluded that the defined QA and technical programs for these activities were being implemented in accordance with the RFETS Quality Assurance Project Plan (QAPjP) and the applicable implementing procedures, and that the processes were effective.

The audit team did not identify any conditions adverse to quality (CAQ) requiring the issuance of a CBFO corrective action report (CAR). One deficiency requiring remedial corrective actions was found during the course of the audit. No Observations resulted from the audit. The audit team presented two Recommendations to RFETS management.

SCOPE AND PURPOSE

Scope

The audit team evaluated the adequacy, implementation, and effectiveness of the RFETS TRU waste characterization processes for two new solid sampling processes: polymerized organic waste sampling and small container waste sampling. In addition, the Building 664 TGS (55-gallon containers, glass matrix) and Building 440 FRAM (85-gallon overpack containers, sludge) were evaluated.

The audit included the following elements:

Technical

Polymerized Organic Waste Sampling
Small Container Waste Sampling
Building 664 TGS (glass matrix)
Building 440 FRAM (85-gallon overpacks)
Project-Level Verification and Validation (V&V) (in support of the above technical elements)

Quality Assurance

The following QA elements were evaluated only to the extent needed to support the above technical elements.

Records/Document Control
Training
Quality Improvement

The evaluation of RFETS TRU waste activities and documents was based on current revisions of the following documents:

Waste Isolation Pilot Plant Hazardous Waste Facility Permit

Quality Assurance Program Document, DOE/CBFO-94-1012

Contact-Handled Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant Project, DOE/WIPP-02-3122

RFETS Quality Assurance Project Plan for the Transuranic Waste Characterization Program, 95-QAPjP-0050

RFETS Transuranic Waste Management Manual, 1-MAN-008-WM-001

Related RFETS technical and QA implementing procedures

2.2 Purpose

Audit A-03-22 was conducted to assess the level of compliance of RFETS waste characterization activities associated with two new solid sampling processes: polymerized organic waste sampling and small container waste sampling. In addition, the Building 664 TGS (55-gallon containers, glass matrix) and Building 440 FRAM (85-gallon overpack containers, sludge) were evaluated.

AUDIT TEAM AND OBSERVER

AUDITORS/TECHNICAL SPECIALISTS

Charlie Riggs	Team Leader, CBFO Technical Assistance Contractor (CTAC)
Prissy Dugger	Auditor, CTAC
Wayne Ledford	Auditor/Technical Specialist, CTAC
Patrick Kelly	Technical Specialist, CTAC

INSPECTORS

Rajani Joglekar	Environmental Protection Agency (EPA)
Jim Oliver	EPA Contractor

OBSERVER

Kevin Krause	New Mexico Environment Department (NMED)
Bob Thilke	NMED Contractor
Scott Webb	Environmental Evaluation Group (EEG)

AUDIT PARTICIPANTS

RFETS individuals contacted during the audit are identified in Attachment 1. A pre-audit meeting was held at RFETS Building 460 on July 22, 2003. A daily meeting was held with RFETS management and staff to discuss the issues and potential deficiencies from the previous day. The audit concluded with a post-audit meeting held at RFETS Building 460 on July 24, 2003.

SUMMARY OF AUDIT RESULTS

Program Adequacy and Implementation

The audit team concluded that the applicable RFETS TRU waste characterization activities, as described in the associated RFETS implementing procedures, satisfactorily meet requirements.

Attachment 2 contains a summary table of audit results. Audit activities, including objective evidence reviewed, are described below and in CBFO checklists and/or objective evidence reviewed forms maintained as QA records. Attachment 3 contains a list of RFETS procedures included in the audit.

Technical Activities

The following sections describe the technical activities reviewed during the audit.

Polymerized Organic Waste Sampling

The audit team examined the polymerized organic waste sampling program for taking solid samples of NOCHAR/liquid solidified mixtures using the core sampling method.

Batch data report CS-440-SB-1001 was reviewed, along with memos establishing the random locations for sampling using this process.

The team witnessed the sampling of a drum of polymerized organic waste (DC3618) on July 22, 2003. The audit team verified that the sampling team properly implemented the requirements of the polymerized waste sampling procedure.

Training records for all personnel performing the sampling were reviewed and verified to meet the training and qualification requirements in accordance with PLN-97-007, *TRU Waste Characterization Program Training Implementation Plan.*

Overall, polymerized organic waste sampling was determined to be adequate, satisfactorily implemented, and effective.

5.2.2 Small Container Waste Sampling

The audit team examined the small container waste sampling program that encompassed taking solid samples using the grid method.

Batch data report SC-440-SB-1001 was reviewed, along with memos establishing the random selection of inner containers and sampling locations for using this process.

The audit team witnessed the sampling of randomly selected inner containers from drum D82532 using the grid method, and verified that the sampling team properly implemented the requirements of the small container waste sampling procedure.

Training records for all personnel performing the sampling were verified and met the training and qualification requirements in accordance with PLN-97-007, *TRU Waste Characterization Program Training Implementation Plan.*

One recommendation was identified for this process. The audit team recommended that when sampling small containers, all tare weight activities should be performed prior to empting the waste containers into the sample pan. This will reduce the time from opening the waste container to collection of the volatile organic compound (VOC) samples (see Recommendation 1).

Overall, the small container waste sampling activities were determined to be adequate, satisfactorily implemented, and effective.

Verification and Validation

The audit team reviewed the V&V process at both the data-generation and the project level for data packages associated with the other audited activities. Overall, data-

generation and project-level data V&V were determined to be adequate, satisfactorily implemented, and effective.

5.2.4 TGS

The Tomographic Gamma Scanner System (TGS) is a stand-alone photon-based measurement system, located in Building 664, which is used to assay TRU wastes in 55-gallon (208-liter) drums that had been previously evaluated and certified by CBFO prior to being removed from service. The TGS was previously located in Building 569, where it was evaluated and approved by CBFO during Audit A-01-12. The system was taken out of service in August 2002 and was recalibrated prior to returning it to service in May 2003 for use with combustibles. Operations for glass matrices began on July 10, 2003. This system is configured to assay both matrices only in 55-gallon drums.

The B664 TGS system includes a high purity germanium (HPGe) photon detector, a Se-75 transmission correction source, and hardware to simultaneously rotate the drum and translate it through a series of vertical segments. It is a two-pass operation: the first pass is used to collect passive gamma data on each segment; the second pass uses the Se-75 source to determine a sample-specific matrix correction for each drum segment. Following initial calibration, the system is subjected to daily background and performance tests using certified Ba-133, Cd-109 and Se-75 sources. The measured Pu-239 value is used to obtain values for WIPP-tracked and other radionuclides using FRAM isotopic information. Pu-242 is calculated by correlation, and other non-measured radionuclides are derived as described in KH-NDA2002-LLD, as previously approved by CBFO. The system has a range of weapons grade plutonium (WG Pu) from the lower limit of detection (LLD) of 99 nCi/gram to 205 grams (65 grams for glass matrix), which allows the system to be used to discriminate between TRU and non-TRU wastes. However, because the system LLD was so close to the 100 nCi/gram criterion, the audit team recommended that the LLD be revisited if the system was used to segregate TRU and non-TRU wastes (see Recommendation 2). RFETS personnel stated that the system would be used primarily to assay waste considerably above 100 nCi/gram. As with all RFETS nondestructive assay (NDA) systems, derived quantities such as TRU activity, plutonium fissile gram equivalent (FGE) and decay heat are calculated in the Waste and Environmental Management System (WEMS) for each waste container. Based on a review of RFETS procedures provided prior to the audit, a checklist was prepared and used to evaluate the following aspects:

Operability and condition of the B664 TGS system

- Instrument calibration, calibration confirmation, matrix qualification, and performance testing required by DOE/WIPP-02-3122
- Traceability of calibration sources used for these activities

Applicability of the B664's calibration to combustible and glass matrices, geometry, and radionuclide content

Implementation and effectiveness of instrument/measurement controls, such as calibration verification (if applicable) and weekly interfering matrix checks

- Participation in the CBFO-sponsored NDA Performance Demonstration Program

Verification that RFETS NDA and data review procedures are properly executed
- Completed batch data reports to ensure data are reported and reviewed as required

Data storage and retrievability
- Personnel qualification and training, specifically for the two individuals performing Expert Technical Analysis (ETR)

This evaluation involved interviewing RFETS NDA personnel and their support contractors, observing equipment and practices, and examining records. Overall, the TGS was determined to be adequate, satisfactorily implemented, and effective.

5.2.5 FRAM

The FRAM gamma spectrometry system is located in Building 440. This is a photon-based segmented gamma system used to provide isotopic ratio data for combustible matrices in 55-gallon drums and quantitative data for a sludge matrix in 55-gallon drums overpacked in 85-gallon drums.

The FRAM consists of a single high-purity germanium (HPGe) passive gamma detector, FRAM software and associated hardware that rotates the drum continuously during assays. CBFO evaluated and approved this system previously when it was used to provide isotopic ratio data that were used in conjunction with quantitative data from other assay systems (e.g., the Building 440 Passive-Active Drum Counter). The distinguishing characteristic of the FRAM system is software that uses peak analysis and basic principles to calculate isotopic ratios of Pu-239 to other gamma-emitting radionuclides, such as Pu-238, Pu-240, Pu-241, Cs-137, Np-237, U-233, U-235, U-238, Am-241 and Pu-242. (Due to its lack of measurable photon emission, Pu-242 is determined using correlation techniques for all NDA systems at RFETS, consistent with standard industry practices employed at other TRU generator sites.)

Performance tests for the FRAM include the following

- An initial energy versus channel calibration conducted with National Institute of Standards and Technology (NIST) traceable sources
- Daily background determinations in accordance with predetermined acceptance limits
- Sample-specific tests for peak shape and resolution based on acceptance criteria for Ba-133 that are collected with each spectrum
- Daily working standard (DWS) counts of a nominal 5-gram Pu-239 source that are subjected to 2 and 3 σ controls for warning and control, respectively

This operation is essentially identical to the mode for which CBFO approval had been granted previously. Because this is a relative determination, there are no restrictions on the instrument's range provided the software's internal measurement criteria are met. The use of the FRAM in the isotopic mode was evaluated concurrently with the quantitative mode use described below.

The audit team also evaluated the FRAM for use as a stand-alone system to provide quantitative values for Pu-239 in combustible and sludge matrices. This is accomplished by correlating the instrument's response at 414 keV and grams of Pu-239 (i.e., an empirically derived mass calibration). This consisted of the following elements:

- Initial system calibration for combustibles using Pu-239 sources
- Calibration confirmation using the combustible matrix and Pu-239 sources
- Qualification of sludge matrix using 55-gallon drums overpacked in 85-gallon drums and Pu-239 sources.

No alteration was made to the FRAM software to obtain quantitative Pu-239 data. Instead, a qualified RFETS technical person evaluates each FRAM spectrum manually and calculates a Pu-239 value using the mass calibration equations described previously. Each spectrum is then subjected to ETR, a process that amounts to one hundred percent ETR. The FRAM's analytical range for mass is from the system's LLD of 0.093 grams to 169 grams of WG Pu. Assuming a typical net sample mass of 189 kg, the LLD corresponds to approximately 41 nCi/g, allowing this system to sort TRU and non-TRU wastes. The Pu-239 value is used to obtain values for WIPP-tracked and other radionuclides using FRAM-derived isotopic information. Pu-242 is derived by correlation, and other non-measured radionuclides are derived as described in KH-NDA2002-LLD, as approved previously by CBFO. With respect to matrix, KH-NDA2003-CAL/QUALP-440FRAM01, Appendix 1 lists all applicable Item Description Codes (IDCs) that are included in the sludge calibration. As with all RFETS NDA systems, derived quantities such as TRU activity, FGE, and decay heat are calculated in WEMS for each waste container.

Based on a review of RFETS procedures provided prior to the audit, a checklist was prepared and used to evaluate the following aspects:

Operability and condition of the FRAM equipment

- Instrument calibration, calibration confirmation, matrix qualification, and performance testing required by DOE/WIPP-02-3122

Traceability of calibration sources used for these activities

Applicability of the system's calibration to sample matrices, geometry, and radionuclide content

Technical adequacy and effectiveness of the FRAM peak area mass calibration for Pu-239

Implementation and effectiveness of instrument/measurement controls, such as calibration verification (if applicable) and weekly interfering matrix checks

- Participation in the CBFO-sponsored NDA Performance Demonstration Program

Verification that RFETS NDA and data review procedures are properly executed

- Completed batch data reports to ensure data are reported and reviewed as required

Data storage and retrievability

Personnel qualification and training, specifically for the two individuals performing ETR.

This evaluation involved interviewing RFETS NDA personnel and their support contractors, observing equipment and practices, and examining records. The RFETS FRAM system initially was found to need additional records to document the calculation of the assay values listed on the FRAM Radioassay Data Sheets (RDS), which was corrected during the audit (see CDA 1). The FRAM system was acceptable in all respects.

Overall, the FRAM was determined to be adequate, satisfactorily implemented, and effective.

CORRECTIVE ACTIONS, OBSERVATIONS, AND RECOMMENDATIONS

Corrective Action Reports

During the audit, the audit team may identify conditions adverse to quality (CAQ) and document such conditions on corrective action reports (CARs).

Condition Adverse to Quality (CAQ) – An all-inclusive term used in reference to any of the following: failures, malfunctions, deficiencies, defective items, nonconformances, and technical inadequacies.

Significant Condition Adverse to Quality – A condition which, if uncorrected, could have a serious effect on safety, operability, waste confinement, TRU waste site certification, compliance demonstration, or the effective implementation of the QA program.

No conditions adverse to quality resulted in the issuance of a CAR during the audit.

Deficiencies Corrected During the Audit

During the audit, the audit team may identify conditions adverse to quality (CAQ). The audit team members and the audit team leader (ATL) evaluate the CAQs to determine if they are significant, using the following definitions. Once a determination is made that the CAQ is not significant, the audit team member, in conjunction with the ATL, determines if the CAQ is an isolated case requiring only remedial action and therefore can be corrected during the audit (CDA). Upon determination that the CAQ is isolated, the audit team member, in conjunction with the ATL, evaluates/verifies any objective evidence/actions submitted or taken by the audited organization and determines if the condition was corrected in an acceptable manner. Once it has been determined that the CAQ has been corrected, the ATL categorizes the condition as a CDA.

Corrected During the Audit (CDA) – Isolated deficiencies that do not require a root cause determination or actions to preclude recurrence, and for which correction of the deficiency can be verified prior to the end of the audit. Examples include one or two minor changes required to correct a procedure (isolated), one or two forms not signed

or not dated (isolated), or one or two individuals that have not completed a reading assignment.

The following CDA resulted from the audit.

CDA 1

There are no calculational records associated with the calculation of assay values that are listed on the RDS.

Information was added to the batch data reports demonstrating how the actual counts (Pu-239 from the spectrum file) were converted to grams.

Observations

An Observation documents marginally acceptable conditions that, if not controlled, might later escalate into a deficiency.

No Observations were presented as a result of the audit.

Recommendations

The following recommendations were provided to RFETS management during the audit.

Recommendation 1

When sampling small containers, all tare weight activities should be performed prior to emptying containers into the sample pan. This will reduce the time from opening the waste container to collection of the VOC samples.

Recommendation 2

The LLD for the TGS is stated as 99 nCi/g, which complies with the CH WAC requirement for an LLD of less than 100 nCi/g if a system will be used to sort TRU/non-TRU wastes. It is recommended that if this system is used to sort at the 100 nCi/g level, the LLD be revisited to lower it such that it is further away from the decision point of 100 nCi/g.

LIST OF ATTACHMENTS

Attachment 1: Personnel Contacted During the Audit
Attachment 2: Summary Table of Audit Results
Attachment 3: Table of Audited RFETS Implementing Procedures

PERSONNEL CONTACTED DURING THE AUDIT

RFETS PERSONNEL CONTACTED DURING AUDIT A-03-22				
NAME	ORG/T ITLE	PREAUDIT MEETING	CONTACTED DURING AUDIT	POST-AUDIT MEETING
Brammer, John	440 Operations; Supervisor		X	
Crawford, Brenda	Data Management; WEMS		X	
D'Amico, Eric	TRU Projects Engineer, TRU Projects	X		X
Dahl, David	QA/QE; MSQA	X	X	X
Donohoue, Tom	NDA Measurements; SAIC		X	
Dreher, David	NDA Manager		X	
Durel, F. M.	MQAS Project; Measurements			X
Ferrera, Carol	KH TWCP QAO	X	X	X
Grady, Frank	RMRS/TRU Waste Projects; TRU Project Engineer	X	X	X
Hodgern, Rick	NDA Supervisor, TGS		X	
Hubbard, Laura	Wastren, TRU V&V	X		X
Kirschenmann, Harley	MSQA, Manager	X	X	X
Leifer, John	TRU Projects; Scientist	X	X	
Lombardi, Kathy	NDA Operator, TGS		X	
McElhaney, Stephanie	Physicist; MS	X	X	X
Morales, Bart	NDA SME, IPAN/FRAM		X	
Phillips, Karen	Engineer, RF-TRU	X	X	
Pigeon, Paul	Material Stewardship; TWCP Training Officer	X	X	
Rodgers, Alan	Deputy, MS	X		X
Rung, Donna	NDA Operator, TGS		X	

RFETS PERSONNEL CONTACTED DURING AUDIT A-03-22				
NAME	ORG/T ITLE	PREAUDIT MEETING	CONTACTED DURING AUDIT	POST-AUDIT MEETING
Seamans, James	NDA Physicist		X	
Sisk, Susan	QA/QE; MSQA	X		X
Stewart, Judith	NDA WIPP Audit Coordinator; Measurements	X	X	X
Wolfe, Mike	PDCO/Waste records Manager, SOM	X	X	X
Xuan, Lam	DOE/RFFO/ERWM; WIPP Coordinator	X	X	X

SUMMARY TABLE OF AUDIT RESULTS

Documents	Concern Classification				QA Evaluation		Technical
	CARs	CDAs	Obs	Rec	Adequacy	Implementation	Effectiveness
Activity							
POLYMERIZED SAMPLING					A	S	E
SMALL CONTAINER SAMPLING				1	A	S	E
VERIFICATION AND VALIDATION					A	S	E
TGS				2	A	S	E
FRAM		1			A	S	E
RECORDS/DOCUMENT CONTROL					A	S	E
QUALITY IMPROVEMENT					A	S	E
TRAINING					A	S	E
TOTALS	0	1	0	2	A	S	E

Definitions

E = Effective
S = Satisfactory
I = Indeterminate
M = Marginal

CAR = Corrective Action Report
CDA = Corrected During the Audit
NE = Not Effective
Obs = Observation

Rec = Recommendation
A = Adequate
NA = Not Adequate